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## **PACKAGING FOR DISPOSABLE SOFT CONTACT LENSES**

### **RELATED APPLICATIONS**

**[0001]** The present application is a continuation-in-part of PCT Patent Application Serial No. PCT/AU02/01105, filed August 7, 2002, designating the United States, which is hereby incorporated by reference in its entirety.

### **BACKGROUND**

**[0002]** The present invention relates to contact lens packaging and more particularly, to an improved economic form of package for a contact lens which satisfies lens packaging criteria, including sterility and environmentally sensitive disposability.

### **PRIOR ART**

**[0003]** Soft disposable contact lenses are commonly contained in disposable packages. As packaging adds to the overall cost of the lens, it should be made as economically as possible but without compromise to the requisite packaging criteria. The traditional blister pack packaging (shown in Figs. 1-3) for disposable lenses (both bi-weekly and daily) consists of a polypropylene receptacle for the lens (herein after referred to as a "boat"), topped by a multi-layer film consisting of polyethylene, aluminum, a bonding agent and polypropylene. The boat is usually an injection molded plastic which has high stiffness but is capable of limited elastic deflection and includes a preformed recess. The boat is filled with a suitable storage solution, preferably saline, and receives a single lens in situ. The blister pack is then autoclaved using steam and pressure to terminal sterility. These blister packs are presented to the patient in boxes of individual packs (Figs. 4-5) or as multiple blister strips.

**[0004]** The marketing objective is to present the contact lens to a patient in an aesthetically pleasing package that both satisfies the statutory requirements for sterility and stability, and allows the patient to remove the lens safely and easily. The packaging is used only once and is discarded after the lens is removed. This impacts the costs of the lens/package combination. In order to reduce the overall

price of the lens to the patient, the cost of the packaging should be kept to an absolute minimum. In addition, disposability of lens packages necessitates conformity with ecological standards.

**[0005]** The lens must be kept hydrated while in the package. The package must be well sealed and should minimize gas transmission through the boat and laminated layer to maximize the shelf life and prevent drying out of the lens contained therein. In use, the user removes the laminated material from a flange formed on the boat by peeling back the cover to expose the lens immersed in a hydrating solution.

**[0006]** A variety of contact lens packages, particularly disposable contact lens packages including preformed blister packs, are taught in the prior art. As exemplified in the prior art, conventional wisdom in the contact lens industry has been to provide preformed stiff packaging which protects the lens from damage from applied load. Examples of typical prior art blister packs are shown in: U.S. Patent No. 5,704,468; U.S. Patent No. 4,392,569; U.S. Patent No. 5,620,088; U.S. Patent No. 5,620,088; U.S. Patent No. 4,691,820; U.S. Patent No. 5,823,327; U.S. Patent No. 5,853,085; EP Publication No. 1 092 645 A1; EP Publication No. 1 092 645; and EP Publication No. 0 129 388.

**[0007]** Flexible retort packages are also known, however, not for use with contact lenses. U.S. Patent No. 4,769,261 discloses a seal layer for use in large institutional sized retort pouches comprising an ABA film structure, wherein the A layers are each composed of a blend of a minor amount of an elastomer and a major amount of a polyolefin and the B layer is composed of a blend of a major amount of an elastomer and a minor amount of polyolefin. Retort pouches made with the ABA film structure as the seal layer exhibit improved impact strength. There is no teaching in the '261 patent to use a retort package for housing a contact lens.

**[0008]** The prior art contact lens packages have a number of disadvantages which include the following:

1. The packages are relatively expensive for daily disposable packages as they use two types of material, one of which is preformed, thus increasing

manufacturing costs. Consumers resist packages which contribute to increased cost of a lens. This will become a greater problem as the daily disposable market grows and becomes more competitive.

2. Prior art packages are traditionally manufactured from two distinctly different materials, one for the boat which houses the lens and another for the cover. This can lead to sealing problems with an attendant risk of compromised sterility. Over time, a poorly sealed blister pack could allow its contents to evaporate and render the pack useless. This could cause stock defects and consequent financial losses to the manufacturer. Correction of such defects would be potentially expensive.

3. A non-sterile lens, due to poor or incomplete package sealing, may expose a patient to the risk of eye infection and subsequent ocular compromise, potentially resulting in litigation.

4, The size of the packaging is a disadvantage as the receptacle is many times larger than the lens itself. As a result of the polypropylene blister component, the individual package is somewhat deeper than the lens from a sagittal perspective, and as such, does not lend itself to a disposable look or convenient stacking due to its shape and size. Therefore, for the traveling consumer, the lenses may prove to be a bulky item.

5. The traditional approach to lens packaging has been to ensure that the original shape of the lens is maintained in the package. This philosophical approach places limitations on package configurations.

**[0009]** There is a long felt need in the disposable contact lens industry to provide an economic, space-efficient, and convenient, disposable contact lens package without compromise to durability, sterility and utility of the lens.

## SUMMARY OF THE INVENTION

**[0010]** The present invention seeks to ameliorate the problems of the prior art packages by providing an alternative and more economical package without compromise to statutory and medical requirements of contact lens packages.

**[0011]** Conventional wisdom requires a disposable contact lens package to be stiff and preformed with a profiled recess to house the lens therein. The preformed recess in the known packages is intended to ensure that the lens shape is maintained and is not deformed by the package. The preferred single-use package of the present invention, on the other hand, is contrary to conventional wisdom as it does not maintain the lens in an equilibrated position, but instead holds the lens in a flattened state. The internal depth of the single-use package is less than the overall natural sagittal depth of the contact lens. Further, the single-use package may be flexible and not preformed, and may contribute to adjustments to the shape of the lens in the package. The present invention challenges the long held view that disposable lens packages must be stiff, and for the most part, rigid and capable of elastic deflection under load. Stiffness of the package was previously thought essential to protect the lens. However, if wall stiffness is abandoned as an essential packaging criterion, alternative contact lens packages with significant space economy may be contemplated.

**[0012]** In one embodiment, the invention is a single-use package with a contact lens therein, and the package has an internal depth which is less than an overall sagittal depth of the contact lens when the contact lens is in its equilibrated form.

**[0013]** In another embodiment, the invention is a blister package with a molded base, a cover and a contact lens therein, and the overall depth of the blister package is less than the natural sagittal depth of the contact lens therein.

**[0014]** In an additional embodiment, the invention is a method of removing a contact lens from a contact lens package. The method includes the steps of: placing a package with a spring disc and a contact lens on an index finger; pushing the index finger through a center of the spring disc such that the contact lens rests

on the tip of the index finger; and placing the contact lens that rests on the index finger into an eye.

**[0015]** In another embodiment, the invention is a combination of a single-use contact lens package and a card onto which the single-use contact lens packages are removably adhered.

**[0016]** An alternate embodiment provides a single use package for retaining a contact lens, with at least one barrier material defining an internal space for holding a contact lens; a medium in the space for maintaining lens hydration; and means to enable release of the lens from said space; where at least one barrier layer is formed from a homogenous, pliable material.

**[0017]** In an additional embodiment, a single-use package capable of holding a contact lens is provided. The package has two sheets of material; and a support member between the two sheets of material. The two sheets of material are sealed and the lens is confined in the package such that is always maintained in the same orientation inside the package.

**[0018]** Also contemplated is a carton containing at least 90 single-use packages each with a contact lens therein, where each of the packages has an internal depth which is less than the overall sagittal depth of each the contact lens within the package.

**[0019]** In another embodiment, the invention is a single-use package with a contact lens therein, where the package is configured such that when the package is opened, the lens is always oriented in the same position as when it was placed into the package.

**[0020]** In yet another embodiment, the invention is a contact lens package container having a plurality of contact lenses therein. The contact lens packages are dispensed such that as one contact lens package is removed, a next contact lens package to be dispensed is automatically moved into a position to be removed.

**[0021]** In another embodiment, a single-use package with a contact lens therein is provided. The package has an internal depth that is less than an overall sagittal depth of the contact lens in its equilibrated form, and the package comprises two sheets of material sealed together, and at least one of the sheets has printing

thereon; and at least one corner that is not sealed so as to serve as an easy-open corner; wherein the contact lens therein is held in a flattened state while the package is sealed and returns to its natural state when the package is opened; and wherein the printing is selected from the group consisting of instructions for use and prescription information; and wherein at least one of the sheets of material is embossed to prevent the lens from sticking to the sheet, thus ensuring that the lens is presented in a predictable orientation when the package is opened.

**[0022]** Another embodiment is a single-use package with a contact lens therein. The package comprises two sheets of material sealed together; a spring disc between the sheets; and an amount of hydration medium; wherein the lens is maintained in a flattened state while the package is sealed.

**[0023]** Also contemplated is a method of dispensing a single-use contact lens package from a group of packages, the method comprising: providing a dispensing container having a plurality of contact lens packages therein; and removing at least one contact lens package from the dispenser.

**[0024]** Also provided is a method for opening a single-use contact lens package having an internal depth that is less than the overall sagittal depth of an equilibrated contact lens therein, the method comprising separating a first barrier layer from a second barrier layer.

**[0025]** In another embodiment, the invention is a single-use package capable of holding a contact lens therein. The package has at least one barrier layer of pliable packaging material forming at least first and second opposing surfaces which define an internal package space in which the contact lens is retained; a hydration medium in the space; and means for enabling release of the contact lens from the package; wherein the at least one barrier layer of material is flat and is flexible.

**[0026]** In an alternate embodiment, a set of retort-type single-use packages for holding contact lenses therein is provided. The packages each comprise: at least one layer of pliable package material forming at least first and second opposing surfaces which define an internal package space in which the contact lens is retained; a medium in the space for maintaining lens hydration; and means for enabling release of the contact lens from the package; wherein the package

material is capable of assuming a generally planar configuration; and wherein the set is formed by joining at least two the packages end to end so that a single package may be torn away from an adjacent package via a frangible connection between the packages.

**[0027]** In another embodiment, a retort-type single-use package comprising an internal space for holding a contact lens and a medium for maintaining lens hydration therein is provided.

**[0028]** Also contemplated is a secondary package for a plurality of contact lens packages comprising a container, where the contact lens packages contained therein have an internal depth that is less than the natural sagittal depth of the contact lens therein; and wherein the container is a shape selected from the group consisting of a circle, rectangle, square, triangle, oval and symmetrical, asymmetrical and rounded variations thereof.

**[0029]** In another embodiment, the invention is a contact lens travel pack comprising a container with a lid and a base, a plurality of contact lenses packages and a handle.

**[0030]** An additional embodiment provides a storage case for a plurality of contact lenses comprising a cover, a container for a plurality of contact lenses wherein the container comprises a lift-out insert.

**[0031]** Also contemplated is a dispensing case for a plurality of contact lenses comprising a cylindrical container wherein each of the two ends of the container open to dispense the contact lenses.

**[0032]** An alternate embodiment is a storage stand for a plurality of contact lens packages comprising a base and a wall extending from the base, wherein the wall comprises a means for the lenses to be attached thereto.

**[0033]** In another embodiment, a storage means for a plurality of contact lenses has a plurality of contact lens holder sheets with a narrow open slot; a plurality of contact lenses attached to the holder sheets; at least one container comprising a base with a narrow open slot and lid with a narrow open slot; and a stand comprising a base and a central extension. The holder sheets are stored within the container and the container slides onto the base.



**[0034]** In another embodiment, a contact lens delivery package comprising an aluminum coated envelope, a plurality of contact lens packages, and nitrogen gas, wherein the envelope is filled with the nitrogen gas prior to sealing.

**[0035]** An additional embodiment provides a single-use package for retaining a contact lens therein, the package comprising at least one package wall defining an internal space for holding the contact lens; a medium in the space for maintaining lens hydration; means to enable release of the lens from said space; wherein the at least one wall is formed from a homogenous or multi-layer, pliable material.

**[0036]** In another embodiment, a kit of joined single use pliable retort-type single use packages for each holding a contact lens is provided. Each single-use package is connected to at least one adjacent package.

**[0037]** A method of producing a disposable contact lens package is contemplated in the present invention. The method comprises the steps of taking a single sheet of pliable material; placing the contact lens on a surface of the sheet; dosing the surface of the material with a hydration maintenance medium; folding the material back on itself to define a space in which the contact lens is held; and sealing the envelope so that the contact lens is held in a sealed environment.

**[0038]** Another embodiment provides a method of making a single-use package with a contact lens therein, the method comprising the following: placing a spring disc over the contact lens; dosing the spring disc and contact lens with a minimum amount of hydration medium; placing one sheet of material on top of the spring disc and lens and placing one sheet of material on the bottom of the spring disc and contact lens; and sealing the top and bottom sheet of material.

**[0039]** In another embodiment, the invention is a method of making a single-use package with a contact lens therein, wherein the package has a depth which is less than the overall sagittal depth of the contact lens, the method comprising the steps of placing the lens and a minimum amount of hydration medium between two sheets; and sealing the sheets together sterilizing the envelope and contents; allowing access to said lens by splitting, peeling or dividing said package along at least one edge.

## DESCRIPTION OF THE DRAWINGS

**[0040]** Figure 1 is a plan view of a typical prior art disposable blister contact lens package.

**[0041]** Figure 2 is a side elevation of the package of Figure 1 with the lid peeled away to release the contact lens therein.

**[0042]** Figure 3 is a perspective view of the partially opened package of Figure 2.

**[0043]** Figure 4 is a side elevation view showing a stacking arrangement for two identical prior art contact lens packages according to one embodiment.

**[0044]** Figure 5 is a perspective view showing a plurality of blister packs stacked as in Figure 4 and contained in a carton.

**[0045]** Figure 6 is a perspective view of a first embodiment of the present invention, showing a single-use package opened to show embossing on the bottom sheet which has a convex indentation.

**[0046]** Figure 7 is a perspective view of a second embodiment of the present invention, showing a single-use package like the embodiment of Figure 6, but showing embossing on the top sheet which has a concave indentation.

**[0047]** Figure 8 is a cross-sectional view of the single-use package of Figure 6.

**[0048]** Figure 9 is a cross-sectional view of the single-use package of Figure 7.

**[0049]** Figure 10 is an example of embossing that can be used in the packages of Figures 6-9, in an abstract pattern.

**[0050]** Figure 11 is an example of embossing that can be used in the packages of Figures 6-9, in a grid pattern.

**[0051]** Figure 12 is an example of embossing that can be used in the packages of Figures 6-9, with a logo.

**[0052]** Figure 13 is a perspective view of a single-use package made from two dissimilar, transparent materials and illustrating a method of opening the package having a depression which contains the contact lens.

**[0053]** Figure 14 is a perspective view of a single-use package made from two similar, opaque materials and illustrating a method of opening the package having a depression which contains the contact lens.

**[0054]** Figure 15 is a perspective view of a partially opened single-use package of another embodiment of the present invention, constructed with a support member.

**[0055]** Figure 16 is an exploded side view of the single-use package of Figure 15.

**[0056]** Figure 17 is an exploded perspective view of the single-use package of Figure 15.

**[0057]** Figure 18 is an exploded perspective view of an alternative embodiment of the single-use package of Figure 15 with a netting.

**[0058]** Figure 19 is a plan view of the single-use package of Figure 15 showing its tear drop shape.

**[0059]** Figure 20 is a plan view of a single-use package like that of Figure 15 in a figure-eight shape.

**[0060]** Figure 21 is a plan view of a single-use package like that of Figure 15 in an asymmetrical tear drop shape.

**[0061]** Figure 22 is a plan view of another embodiment of the present invention showing a single-use package with a first space for a contact lens having a foil covering and a second space for hydration medium with a cap.

**[0062]** Figure 23 is a plan view of the single-use package of Figure 22 without the cover that encloses the lens.

**[0063]** Figure 24 is a plan view of a tear drop shaped single-use package with a first space for a contact lens having a foil covering and a second space for hydration medium with a cap.

**[0064]** Figure 25 is a plan view of the single-use package of Figure 24 without the cover that encloses the lens.

**[0065]** Figure 26 is a side elevation view of the single-use package of Figure 22 with the cover intact.

[0066] Figure 27 is a side elevation view of the single-use package of Figure 22 with the cover partially peeled off.

[0067] Figure 28 is a perspective view of the single-use package of Figure 22 showing the cover being peeled off.

[0068] Figure 29 is a plan view of another embodiment of a single-use package of the present invention with a first space for a contact lens having a cover and a second space for hydration medium that has a channel to release hydration medium once separated from the single-use package.

[0069] Figure 30 is a plan view of the single-use package of Figure 29 with the cover removed.

[0070] Figure 31 is a perspective view of the single-use package of Figure 29 showing the cover being partially removed.

[0071] Figure 32 is a side elevation view of the single-use package of Figure 29.

[0072] Figure 33 is a side elevation view of the single-use package of Figure 29 with the cover partially peeled off.

[0073] Figure 34 is a perspective view of the single-use package of Figure 30 showing the first and second space of the single-use package being separated to release the hydration medium.

[0074] Figure 35 is a plan view of another embodiment of a single-use package of the present invention with a first space for a contact lens and a second space for hydration medium, both of which have foil covers.

[0075] Figure 36 is a plan view of the single-use package of Figure 35 without the cover that encloses the lens.

[0076] Figure 37 is a side elevation view of the single-use package of Figure 35 with the cover peeled away from the first space.

[0077] Figure 38 is a side elevation view of the single-use package of Figure 35 with the cover removed from both the first and second spaces.

[0078] Figure 39 is a side elevation view of the single-use package of Figure 35 with the cover starting to be peeled away from the second space.

**[0079]** Figure 40 is a perspective view of the single-use package of Figure 35 showing the cover being peeled away from either the first or second space.

**[0080]** Figure 41 is a plan view of two single-use packages, each having a first and second space, and connected by a frangible joint.

**[0081]** Figure 42 is a plan view of one of the single-use packages of Figure 41 without the covering.

**[0082]** Figure 43 is a perspective view of one of the single-use packages of Figure 42 showing the cover being peeled away from the first space containing a contact lens.

**[0083]** Figure 44 is a side view of the single-use package of Figure 42 with a contact lens therein with a cover that is intact.

**[0084]** Figure 45 is a side view of the single-use package of Figure 42 with the cover peeled away and the contact lens in its equilibrated state.

**[0085]** Figure 46 is a side view of a prior art blister pack with a contact lens therein that is folded.

**[0086]** Figure 47 is a side view of a prior art blister pack with a contact lens therein that is stuck to the side.

**[0087]** Figure 48 is a side view of a prior art blister pack with a contact lens therein that is inverted.

**[0088]** Figure 49A is an exploded perspective view of a sachet type single-use package.

**[0089]** Figure 49B is a cross-sectional view of the single-use package of Figure 49A.

**[0090]** Figure 50A is an exploded perspective view of a polypropylene and foil type single-use package.

**[0091]** Figure 50B is a cross-sectional view of the single-use package of Figure 50A.

**[0092]** Figure 51A is an exploded perspective view of an all polypropylene type single-use package.

**[0093]** Figure 51B is a cross-sectional view of the single-use package of Figure 51A.

**[0094]** Figure 52 is a side view of another embodiment of the single-use package of the present invention showing the internal depth of the single-use package.

**[0095]** Figure 53 is a plan view of a single-use package with an island-like protuberance upon which the contact lens rests.

**[0096]** Figure 54 is a cross-sectional view of the single-use package of Figure 53 taken along line 54-54 showing the contact lens resting on the island-like protuberance.

**[0097]** Figure 55 is another cross-sectional view of the single-use package of Figure 53 taken along line 55-55 showing the contact lens resting on the island-like protuberance.

**[0098]** Figure 56 is a plan view of a tear shaped polypropylene support member with a cut out in the handle.

**[0099]** Figure 57 is a cross-sectional view of a single-use package with the support member of Figure 56 that is opaque.

**[00100]** Figure 58 is a cross-sectional view similar to that of Figure 57 but with the cover peeled back.

**[00101]** Figure 59 is a plan view of the front of a single-use package containing the support member of Figure 56.

**[00102]** Figure 60 is a plan view of the back of a single-use package containing the support member of Figure 56.

**[00103]** Figure 61 is a plan view of one embodiment of a polypropylene spring disc for use in a single-use package.

**[00104]** Figure 62 is a plan view of a second embodiment of a polypropylene spring disc for use in a single-use package.

**[00105]** Figure 63 is a plan view showing the inside of a single-use package containing a third embodiment of a polypropylene spring disc and contact lens.

**[00106]** Figure 64 is a cross-sectional view of the single-use package of Figure 63 showing a polypropylene spring disc and a contact lens in a flattened state.

[00107] Figure 65 is a plan view of the front of a single-use package with reliefs within the foil on either side of the single-use package for easy opening.

[00108] Figure 66 is a plan view of the back view of a single-use package of Figure 65.

[00109] Figure 67 is a cross-sectional view of a single-use package of Figure 63 showing a contact lens and polypropylene spring disc inside a single-use package, in a flattened configuration.

[00110] Figure 68 is a cross-sectional view of the single-use package of Figure 63 with the cover beginning to be peeled back and the spring disc and contact lens in an equilibrated state.

[00111] Figure 69 is an exploded perspective view illustrating the construction of a single-use package containing a fourth embodiment of a spring disc.

[00112] Figure 70Aa plan view of a fifth embodiment of a spring disc.

[00113] Figure 70B is a side view of the embodiment of Figure 70A showing the spring disc and contact lens in a flattened state.

[00114] Figure 70C is a side view of the embodiment of Figure 70A showing the spring disc and contact lens in an equilibrated state.

[00115] Figure 71 is a plan view of a sixth embodiment of a spring disc.

[00116] Figure 72 is a plan view of a seventh embodiment of a spring disc.

[00117] Figure 73 is a plan view of an eighth embodiment of a spring disc.

[00118] Figure 74 is a plan view of a ninth embodiment of a spring disc.

[00119] Figure 75 is a plan view of a tenth embodiment of a spring disc.

[00120] Figure 76 is a plan view of an eleventh embodiment of a spring disc.

[00121] Figure 77 is a plan view of a twelfth embodiment of a spring disc.

[00122] Figure 78 is a plan view of a thirteenth embodiment of a spring disc.

[00123] Figure 79 is a plan view of a fourteenth embodiment of a spring disc.

[00124] Figure 80 is a plan view of a fifteenth embodiment of a spring disc.

[00125] Figure 81 is a plan view of a sixteenth embodiment of a spring disc.

- [00126] Figure 82 is a plan view of a seventeenth embodiment of a spring disc.
- [00127] Figure 83 is a plan view of an eighteenth embodiment of a spring disc.
- [00128] Figure 84 is a plan view of a nineteenth embodiment of a spring disc.
- [00129] Figure 85 is a plan view of a twentieth embodiment of a spring disc.
- [00130] Figure 86 is a perspective view of a single-use package with the spring disc of Figure 70A with a contact lens thereon.
- [00131] Figure 87 is a cross-sectional view of a contact lens and spring disc in a flattened state in the sealed single-use package of Figure 90.
- [00132] Figure 88 is a cross-sectional view of a contact lens and spring disc in an equilibrated state in a single-use package of Figure 90 with the cover removed.
- [00133] Figures 89A-E are perspective views of a single-use package with a spring disc and contact lens thereon with an index finger pushing through the spring disc such that the contact lens rests upon the tip of the index finger and the index finger extends through the opening of the single-use package so that the contact lens may be placed in the eye.
- [00134] Figure 90 is a plan view of a single-use package with an oval shape and a tear notch.
- [00135] Figure 91 is the single-use package of Figure 90 with the cover removed to show the spring disc and contact lens therein.
- [00136] Figure 92 is a plan view of a single-use package with a rounded rectangle shape and a tear notch.
- [00137] Figure 93 is a plan view of a single-use package with an oval shape and a peel open hinge-type cover.
- [00138] Figure 93A is a perspective view of the single-use package of Figure 93 showing the hinge-type cover being opened.
- [00139] Figure 94 is a plan view of a single-use package with an asymmetrical tear shape and two tear notches at the narrow end.



**[00140]** Figure 95 is a plan view of two of the single-use packages of Figure 94 packaged together.

**[00141]** Figure 96 is a plan view of a square shaped sachet-type single-use package with a tear notch.

**[00142]** Figure 97 is a plan view of a rounded corner square sachet-type single-use package with a tear-off end and cut out tabs that enhance visibility of the tear-off end.

**[00143]** Figure 98 is a plan view of an embodiment of a sachet-type single-use package, half being oval shaped and half being a rounded square shape with a half-moon tear-off end.

**[00144]** Figure 99 is a plan view of a sachet-type single-use package with a rounded square shape and a finger shaped tear-off end.

**[00145]** Figure 100 is a plan view of two sachet-type single-use packages of Figure 99 showing the finger shaped tear-off end of one fit into the finger shaped tear-off end of the other.

**[00146]** Figure 101 is a perspective view of a double curved-shape single-use package with the cover being peeled back to expose the lens therein.

**[00147]** Figure 102 is a perspective view of a plurality of the single-use packages of Figure 101 stacked.

**[00148]** Figure 103 is a perspective view of a molded single-use package with a pull-top opening that has been peeled back to expose the inner space and contact lens therein.

**[00149]** Figure 104 is a perspective view of one embodiment of a pull-top single-use package with a handle detail.

**[00150]** Figure 105 is a perspective view of the single-use package of Figure 104 with the top pulled back and the base bent to expose the contact lens therein.

**[00151]** Figure 106 an exploded perspective view of a single-use package with a cover and base that lifts up.

**[00152]** Figure 107 is a perspective view of the single-use package of Figure 106 with the cover and base lifted up.

**[00153]** Figure 108 is a perspective view of an embodiment of the single-use package in which there is a pointed edge that breaks open the top cover.

**[00154]** Figure 109 is a perspective view of the single-use package of Figure 108 with the top cover broken open.

**[00155]** Figure 110 is a cross-sectional view of a single-use package with a polypropylene spring disc and a break-open edge.

**[00156]** Figure 111 is a perspective view of the cross-section of the single-use package of Figure 110 showing the break-open edge being broken.

**[00157]** Figure 112 is a perspective view of the polypropylene spring disc used in the embodiment of Figure 111 and contact lens thereon.

**[00158]** Figure 113 is a cross-sectional view of the single-use package of Figure 110 with a break-open edge that has been broken and has the foil cover peeled away, allowing the polypropylene disc and contact lens to re-equilibrate.

**[00159]** Figure 114 is a perspective view of a retort-type single-use package according to an embodiment of the invention.

**[00160]** Figure 115 is a perspective view of the retort-type single-use package of Figure 114 with the contact lens exposed by peeling a layer.

**[00161]** Figure 116 is a plan view of a strip of retort-type single-use packages.

**[00162]** Figure 117 is a plan view of the strip of retort-type single-use packages of Figure 116 including a hydration medium pack.

**[00163]** Figure 118 is an exploded perspective view of an envelope, containing a plurality of retort-type single-use packages, packaged in a secondary package containing a large number of envelopes holding retort-type single-use packages strips according to a embodiment.

**[00164]** Figure 119 is a plan view of a secondary packaging for a plurality of single-use packages in which there are six stacks of five single-use packages in separate compartments.

**[00165]** Figure 120 is a cross-sectional view of the secondary packaging of Figure 119.

**[00166]** Figure 121 is a perspective view of two of the secondary packages of Figure 119 stacked on top of each other, providing a 30 day supply of daily contact lenses for each eye.

**[00167]** Figure 122 is a perspective view of six of the secondary packages of Figure 119, providing a 90 day supply of daily contact lenses for each eye.

**[00168]** Figure 123 is a perspective view of twelve of the secondary packages of Figure 119, providing a 180 day supply of daily contact lenses for each eye.

**[00169]** Figure 124 is a plan view of a travel pack with two single-use packages.

**[00170]** Figure 125A is a plan view of another embodiment of secondary packaging in which there are three compartments each containing ten single-use packages.

**[00171]** Figure 125B is a cross-sectional view of the secondary packaging of Figure 125A.

**[00172]** Figure 126 is a plan view of a transparent travel package for a plurality of single-use packages.

**[00173]** Figure 127 is a front elevation view of the travel package of Figure 126.

**[00174]** Figure 128 is a side elevation view of the travel package of Figure 126.

**[00175]** Figure 129 is a plan view of the travel package of Figure 126 showing the inside of an open travel package holding a plurality of single-use packages, a sliding guide for the single-use package compartment and a mirror.

**[00176]** Figure 130 is a side elevation view of the open travel package of Figure 129 illustrating a means of hanging the travel package on a hook.

**[00177]** Figure 131 is a plan view of a travel package similar to that of Figure 126 but made of opaque material.

**[00178]** Figure 132 is a plan view of an alternative embodiment of the travel package of Figure 129 with a stationary guide for maintaining the single-use packages in compartments marked as “L” for left and “R” for right.

**[00179]** Figure 133 is a side elevation view of a package capable of holding enough single-use packages for 90 days of contact lens use for both right and left eyes, and a travel package attached to the 90 day package.

**[00180]** Figure 134 is a side elevation view of the 90 day package of Figure 133 without the travel package attached.

**[00181]** Figure 135 is a side elevation view of the side of the 90 day package of Figure 133 showing that the travel pack may be slid onto the cover of the 90 day package and then snapped into place.

**[00182]** Figure 136 is a side elevation view of the 90 day package with the travel pack of Figure 133 showing that the 90 day package may be used as a sunglass case when all of the single-use packages have been removed.

**[00183]** Figure 137 is a side elevation view of the 90 day package of Figure 134 showing that the insert containing the single-use packages may be lifted up and out of the package using the handle, once the cover to the 90 day package has been removed.

**[00184]** Figure 137A is an exploded perspective view of a rubber stopper that prevents the insert containing the single-use packages from slipping down into the 90 day package.

**[00185]** Figure 138 is a side elevation view of the back of a 90 day package showing that a tab and strip of single-use packages being lifted out of the 90 day package.

**[00186]** Figure 138A is a plan view of a tab that indicates there are only 30 contact lenses remaining in the 90 day package, as well as prescription and re-order information.

**[00187]** Figure 138B is a plan view of a tab that indicates there are only 10 lenses remaining in the 90 day package as well as prescription and re-order information.

**[00188]** Figure 139 is a perspective view of the single-use package secondary packaging container with a plurality of single-use packages therein.

**[00189]** Figure 140 is a plan view of the front of a single-use package holder sheet for a plurality of single-use packages wherein the single-use packages are arranged in a circular configuration.

**[00190]** Figure 141 is a plan view of the back of the holder sheet of Figure 140.

**[00191]** Figure 142 is a plan view of the front of a single-use package holder sheet for a plurality of single-use packages wherein the single-use packages are arranged in two parallel rows.

**[00192]** Figure 143 is a plan view of the back of the holder sheet of Figure 142.

**[00193]** Figure 144 is a plan view of a blister-type single-use package of another embodiment of the present invention.

**[00194]** Figure 145 is a side elevation view of a stack of the blister-type single-use packages of Figure 144.

**[00195]** Figure 146 is a plan view of a secondary packaging container for a plurality of the blister-type single-use packages of Figure 144 arranged in a circular configuration.

**[00196]** Figure 147 is an exploded perspective view of the secondary packaging container of Figure 146 also showing a lid.

**[00197]** Figure 148 is a cross-sectional view of the secondary packaging container of Figure 147 in which there is a 30 day supply of contact lenses.

**[00198]** Figure 149 is a cross-sectional view of another embodiment of a secondary packaging container like that of Figure 147 in which there is a 90 day supply of contact lenses.

**[00199]** Figure 150 is a plan view of another embodiment of a single-use package of the present invention with a rounded asymmetrical triangle shape.

**[00200]** Figure 151 is a plan view of a combination of six of the single-use packages of Figure 150 in a circular arrangement.

**[00201]** Figure 152 is plan view of a donut-shaped single-use package holder sheet.

**[00202]** Figure 153 is an exploded perspective view of a plurality of the holder sheets of Figure 152 being placed into a round box.

**[00203]** Figure 154 is a perspective view of a stand for containing a plurality of the boxes of Figure 153.

**[00204]** Figure 155 is a perspective view of another embodiment of a secondary package having an eye-mask shaped and containing a plurality of round single-use packages of the present invention.

**[00205]** Figure 156 is a plan view of two single-use packages clipped onto a sheet for easy transport.

**[00206]** Figure 157 is a plan view of another single-use package of the present invention with a rounded triangle shape.

**[00207]** Figure 158 is a plan view of another embodiment of the present invention in which a circular secondary packaging container holds a 30 day supply of oval shaped single-use packages arranged in a circular configuration.

**[00208]** Figure 159 is a plan view of another embodiment of the present invention in which a rectangular secondary packaging container holds a 30 day supply of single-use packages arranged in two parallel rows.

**[00209]** Figure 160 is a perspective view of a secondary box for delivery of a plurality of single-use packages.

**[00210]** Figure 161 is a perspective view of a stand for a 90 day supply of round single-use packages.

**[00211]** Figure 162 is a perspective view of a delivery package of the present invention comprising an aluminum-coated envelope with a plurality of single-use packages therein.

**[00212]** Figure 163 is a perspective view of a single-use package dispensing case of the present invention.

**[00213]** Figure 164 is a perspective view of the single-use package dispensing case of Figure 163 with one end opened and a single-use package removed.

## DETAILED DESCRIPTION

**[00214]** The present invention will now be described according to the preferred, but non-limiting, embodiments and with reference to the accompanying illustrations.

**[00215]** The term “internal depth” means the depth of a contact lens holding area within the contact lens package determined by subtracting the height of the combined opposing wall layers making up the contact lens holding area of the package from the total height of the contact lens holding area of the package when the package is lying on a flat surface.

**[00216]** The term “sagittal depth” means the total height of a contact lens resting in a relaxed state on a flat surface.

**[00217]** Referring to a contact lens in its “equilibrated state” means that the contact lens is in a resting state unrestricted by any external forces affecting its shape or height.

**[00218]** Throughout the specification the term homogenous refers to a package wall formed from a single layer (i.e. non-laminated layer) of the same material. Many of the packages described as being made from a homogenous single layer material may also be made from a multi-layer, laminated, material which may be formed from a combination of suitable plastics or a combination of suitable plastics and a metallic layer as described herein.

**[00219]** Referring to Figures 1 and 2, there is shown a typical prior art disposable blister contact lens package 1 which is formed in two parts. The package 1 comprises a blister pack member 2 which is sealed by a membrane 3 forming a lid on the package 1 and which may be peeled away to release a contact lens 4 therein. In Figure 3, the package of Figure 2 is shown with the membrane 3 peeled away to expose the contact lens 4. Typically, the member 2 will be a preformed blister pack and include a profiled recess 5 which provides a recess in which a lens may be placed. The member 2 is typically injection molded and the package is completed with a sealing membrane 3 which mates with a flange 6 to create a sterile seal. The contact lens 4 is immersed in a solution 7 which keeps

the lens hydrated until it is removed from the pack. The injection molded pre-form makes this an expensive package to manufacture, with the result that the contact lens will inevitably be more expensive for the consumer.

**[00220]** Figure 4 shows a stacking arrangement for two identical prior art contact lens packages 10 and 11. It can be seen from Figure 4 that although two packs conveniently inter-fit, they take up a thickness greater than the thickness (or depth) of two packs. Ideally, a lens package should take up as little space as possible considering the relatively small size of a contact lens. Economy of storage space is a critical issue where lenses are mass produced. The existing blister packs take up a disproportionate amount of space relative to the size of the lens, leading to increased handling and storage costs. Figure 5 shows a plurality of like blister packs 12 stacked as in Figure 4 and retained in a carton 13. This bulky, inconvenient, and materials-intensive form of lens packaging exists as a result of conventional wisdom which suggests that lenses can only be stacked in rigid containers which isolate the lens from external load.

**[00221]** In one embodiment of the single-use package of the present invention, shown in Figures 6 and 8, the single-use package 18 consists of a first sheet 14 and a second sheet 15 of material sealed together. In this embodiment, one of the two sheets 15 is embossed 16 and also has a convex indentation 19. The embossing 16 aids the release of the lens 4 as it prevents the lens 4 from adhering to the embossed sheet 15 as shown in Figure 8. Therefore, it is possible to have the contact lens 4 present in a predictable orientation upon opening of the single-use package 18. As shown in the alternate embodiment of Figures 7 and 9, the embossed surface 16 may alternatively be on the top sheet 14, which in this example, also has a concave indentation 19. As shown in Figure 9, the contact lens in this example adheres to the bottom, non-embossed sheet. The embossing 16 may take numerous forms, for example, abstract patterns, grids and logos, as shown in Figures 10-12. Alternatively, Figures 13 and 14 show embodiments of the invention in which the single-use package 18 has no embossing. The sheets 14 and 15 may be opaque, transparent or colored, such as white or light green. If the sheets are colored, one preferred embodiment is to have the color displayed



inwardly toward a contact lens so that the lens may be easily visualized. In addition, the sheets 14 and 15 may have printing thereon. Such printing may include, for example, symbols (such as text, diagrams, drawings), prescription, instructions, and manufacture information. This printing may be on the outside of the package, or more preferably, displayed inwardly toward the contact lens (when the package is sealed), which will aid visualization of the contact lens.

**[00222]** Figures 7-9 illustrate another embodiment of the single-use package 18 in which the two sheets 14-15 have an indentation 19. In one embodiment, one sheet of the single-use package has a convex indentation while the opposing sheet has a concave indentation. The posterior or concave surface of the contact lens rests on the convex indentation, while the concave surface of the adjacent sheet maintains the lens in its place. Such a configuration is easily stackable in large numbers.

**[00223]** In another embodiment, shown in Figures 15-17 and 19, the single-use package 156 includes a support member 20. The support member 20 encircles the contact lens 4 within the single-use package 156. The support member 20 may be flexible or rigid and may be, for example, composed of any suitable polyolefin such as polypropylene (PP), polypropylene copolymer (PPCO), polymethylpentene (TPX), polycarbonate (PC), polysulphone (PSF), polyethylene naphthalate (PEN), cyclic olefin copolymer (COC), or fluorinated ethylene propylene (FEP), or other similar material. The support member 20 does not change the flat profile of the single-use package 156 nor does it alter the depth of the single-use package 156 such that the single-use package 156, when sealed, has a depth that is less than the natural sagittal depth of the contact lens 4. The support member 20 may also serve as a handle 21 to assist in moving or opening the single-use package 156. The handle area 21 may optionally have a cut out 24 that further assists gripping the single-use package 18 as shown in Figure 17.

**[00224]** In another embodiment, the support member 20a has mesh-like netting 22, as illustrated in Figure 18. The netting 22 serves as an additional support for the contact lens 4 as the lens rests upon the netting 22 when in the single-use package 157. The netting 22 may be composed of any suitable

polyolefin material such as: polypropylene (PP), polypropylene copolymer (PPCO), polymethylpentene (TPX), polycarbonate (PC), polysulphone (PSF), polyethylene naphthalate (PEN), cyclic olefin copolymer (COC), or fluorinated ethylene propylene (FEP), or other similar material.

**[00225]** The single-use package, with or without the support member 20, may have a variety of shapes. For example, the single-use package may be a square, rectangle, oval, round, tear shaped, figure eight, triangle, and combinations thereof, all of which may be symmetrical, asymmetrical, straight edged or rounded, examples of which are shown in Figures 20-21, 89-94, 96-108, 150 and 156. Additional shapes are acceptable as long as they may accommodate a soft contact lens.

**[00226]** In other embodiments, shown in Figures 22-43, the single-use package may have a first space for a contact lens 34 and a second space for hydration medium 32. This arrangement may take on a variety of configurations, some of which allow the second space for hydration medium to be flat, bulbous and optionally to serve as a handle. Figures 22 and 28 illustrate that the second space for hydration medium 32 may be attached to the first space for the contact lens 34 and the two spaces are separated by a seamed connection 31 between the two sheets comprising the single-use package 160. The connection 31 may be flexible and frangible and thus the second space 32 may snap off as in Figure 34, or be torn away from the first space 34 as in Figures 22, 28 and 35. The space for the hydration medium 32 may have a cap 30. The cap 30 may be removed by pulling, twisting, or snapping off. The first space 34 and second space 32 may be opened at the same time or different times. In one example, the first space for the contact lens 34 is opened prior to the second space for the hydration medium 32. In an alternative example, the second space for the hydration medium 32 may be opened prior to the first space for the contact lens 34. The first and second space may be opened by the same or different means. The first and second space 34, 32 may both be opened by peeling away a foil 26 or other covering, or alternatively, the first space 34 may be opened by peeling away the cover 26 and the second space 32 may be opened by removing a cap 30. The cover may be heat sealed to a

base, a support member or to one of the sheets comprising the single-use package. The heat sealing may be around the entire perimeter or alternatively, solely around the first space containing the contact lens. The first and second spaces 34, 32 may be separated before or after one or both of them are opened. In an alternative embodiment, the second space for hydration medium 32 may be opened by separating the second space 32 from the first space 34, thus exposing an opening or channel 36 from which the hydration medium may escape, as shown in Figure 34. In another embodiment, both the first and second space may be opened by peeling off one of the two sheets 14-15 of material forming the single-use package 163. Figures 37-39 show that in this embodiment, the two spaces 32 and 34 may be opened from either end and may be opened at the same time or only one space may be opened while the other remains sealed.

**[00227]** The hydration medium may be any solution suitable for use with contact lenses. For example, the hydration medium may be re-wetting solution, cleansing solution or any other maintenance solution. An example of a suitable hydration medium is saline solution.

**[00228]** In another embodiment, examples of which are shown in Figures 41, 116 and 117, one single-use package 164 and 118 may be connected to another identical single-use package 164 and 118. The connected single-use packages may form strips of single-use packages 41. The number of single-use packages 164 and 118 connected may be between 1 and 90, or alternatively, between 90 and 180 packages. The strips of single-use packages 41 may be rolled up or folded in zigzag fashion. The single-use packages 164 and 118, connected to form strips 41, may have only a first space 34 for a contact lens or alternatively may also have a second space for hydration medium 32. The connection 31 between the single-use packages is flexible and frangible.

**[00229]** The strip of single-use packages 41, or alternatively, a plurality of individual single-use packages, may be used in a pop-up dispenser. In this embodiment, a plurality of single-use packages 164 and 118 are connected to one another via frangible connections 31, 75-77 and are dispensed one at a time such that as one single-use package 164 is removed, another is available in a dispensing

region of the dispenser. Alternatively, a plurality of individual single-use packages are contained in a dispenser in such a way that as one single-use package 164 is removed, it engages a second similar single-use package 164 thus making the second package 164 available for subsequent removal.

**[00230]** The single-use package maintains the contact lens 4 therein in a flattened state and restricts the movement of the contact lens 4 while the package is sealed, examples of which are shown in Figures 44 and 67. In Figure 44, the single-use package 164 prevents the problematic movement of the contact lens 4 that occurs in the typical prior art blister pack 27. As illustrated in Figures 46-48, a contact lens 4 in a prior art blister pack 27 is able to invert, shift positions, stick to the side, and fold in half. However, the single-use package of the present invention maintains the contact lens 4 in the same position as when it is first placed within the package and sealed. In addition, the contact lens 4 is always presented in a predictable orientation when the single-use package is opened. This reduces the need to handle the lens prior to insertion thus reducing the risk of lens damage or contamination of both the lens and the eye of the wearer. This also facilitates placement of the contact lens in the eye of the wearer. Typically, the wearer's vision will be somewhat compromised prior to insertion of the contact lens. Therefore, it is useful to know, without being able to see, what orientation the contact lens is in when the package is opened.

**[00231]** Even though a defining characteristic of the single-use package of the present invention is that it maintains the contact lens 4 therein in a flattened state, the single-use package itself need not necessarily be flat. The single-use package may take on a variety of shapes, although preferably, the single-use package will have a slim profile and be able to be stacked and packaged compactly.

**[00232]** As shown in Figures 49A-51B, there are a variety of compositions and configurations useful for producing a single-use package 18. In Figures 49A and B, a sachet type single-use package 165 is composed of 3 layers. The two outer layers 14, 15 are usually aluminum foil and the inner layer is polypropylene or any other suitable polyolefin. The typical thickness of this type of single-use

package 165 is approximately 1.0 mm, however, it can be less depending upon the choice of materials and design. Aluminum foil and polypropylene (or any other suitable material) may also be used in a non-sachet type single-use package 166, as shown in Figures 50A and B, with an approximate total thickness of 1.0-2.0 mm. In this embodiment, the foil may serve as both a cover and a base for the package. An all polypropylene single-use package 167 may also be produced, as in Figures 51A and B, with an approximate total thickness of 2.0-3.0 mm. These compositions may be used to produce single-use packages with or without spring discs 46, support members 20, and may be any shape or color. For instance, other suitable polyolefins may be used in lieu of, or in combination with, polypropylene.

**[00233]** Figure 52 is another embodiment of the single-use package 188 in which the internal depth ("ID") of the single-use package is shown. The internal depth of the single-use package of the present invention is approximately 0.1 mm to 3.5 mm, more preferably, 0.1 mm to 3.0 mm. Regardless of the dimensions, the internal depth is always less than the natural sagittal depth of the contact lens in its equilibrated state. In an equilibrated state, the natural sagittal depth of a contact lens is greater than 3.8 mm and often as high as 5.0 mm.

**[00234]** In one embodiment of the single-use package 168, there is an island-like protuberance 42 in the recess 43, upon which the contact lens 4 rests. As shown in Figures 53-55, the contact lens 4 is maintained in a flattened state and is immobilized upon the protuberance 42 by the cover 26 of the single-use package. In addition, there may be a textured surface on at least one side of the single-use package. For example, the texture may be raised bumps, or ridges and may be on one or both sides of the single-use package or on a handle. In this embodiment, there are raised features 44 on one end of the single-use package to allow the user to easily grip the single-use package 168 as well as cut outs 24 on the corners of the base to facilitate removal of the cover sheet 26.

**[00235]** In another embodiment, the single-use package 156 is a tear shape with a cut out 24 in the support member 20 to facilitate handling of the single-use package 156. Figures 56-60 show the tear shaped single-use package 156 with and without the cover 26 in both opaque and transparent varieties. The side view

illustrates that the contact lens 4 therein is maintained in a flattened state until the cover 26 of the single-use package 156 is removed.

**[00236]** A polypropylene spring disc 46 may be added to a single-use package 169 to assist in maintaining the contact lens 4 in a flattened state while the single-use package 4 is sealed and then assist the contact lens 4 in returning to its equilibrated state when the single-use package 169 is opened (see Figures 68). As shown in Figures 61-62, and 69-86, numerous embodiments of the spring disc 46a-t are contemplated in the present invention. A unifying characteristic of all of the spring discs 46a-t is that in their equilibrated state, the spring discs 46a-t are not flat. However they are compressible and are able to be maintained in a flattened state within the sealed single-use package 169, as shown in Figures 63-64, and 67-68.

**[00237]** Figures 67-68 and 110-113 illustrate that in its relaxed state, the spring disc 46c is arched, however when placed between the two sheets 14,15 of the single-use package 18 and sealed, the spring disc 46c, and hence the contact lens 4 thereon, is flattened (see Figures 67). When the single-use package 169 is opened, the spring disc 46c pops up to its arched state and the contact lens 4 is presented in a 'ready to insert' orientation, that is, the lens 4 may be pinched off, between the thumb and forefinger, and inserted into the eye of the wearer (see Figure 68). A perspective view of a contact lens 4 resting on a spring disc 46e is provided in Figure 86. As shown, in an equilibrated state, the spring disc 46e has projections 51 that extend upward toward the contact lens 4 and it is the projections 51 that provide support for the central portion contact lens 4 as it rests thereon. The peripheral portion of the contact lens rests around the base 53 of the spring disc 46e.

**[00238]** Figure 69 illustrates the assembly of a single-use package 170 that includes a spring disc 46d. In this embodiment, the spring disc 46d is placed on a molded PET sheet which forms a base 50 of the single-use package 170. The contact lens 4 rests with its concave side upon the spring disc 46d and the single-use package 170 is sealed with an aluminum foil cover 26.

**[00239]** Preferably, the concave side of the contact lens 4 rests upon the spring disc 46d. However, in another embodiment, the convex side of the contact lens 4 rests upon the spring disc 46. In this embodiment, the sealed single-use package 191 holds the lens 4 and spring disc 46e in a flattened state and when opened, both return to their equilibrated form as shown in Figures 87-88.

**[00240]** Another embodiment is presented in Figures 89A-E. A method of insertion made possible by using a spring disc 46e is illustrated. A semi-soft polypropylene spring disc 46e is used to position the contact lens 4 in an orientation that is ready for insertion into the eye of a wearer. As shown, the spring disc 46e is placed upon the tip of an index finger. The finger is then pushed through the center of the spring disc 46e such that it makes contact with the convex side of the contact lens 4. The finger continues to proceed through the center of the spring disc 46e until the spring disc 46e drops to the base of the finger and the contact lens 4 rests on the tip of the index finger. The contact lens 4 is then in a position to be easily inserted into the eye of the wearer. Thus, the contact lens 4 is inserted with a minimum of handling, reducing the risk of contamination to the contact lens 4 and the eye.

**[00241]** In another embodiment, a method of making a single-use contact lens package is provided. In this method, a spring disc is placed on top of a contact lens. The spring disc and contact lens are then dosed with a minimum amount of hydration medium and subsequently a sheet of material is placed above and below the spring disc and contact lens. The sheets of material are then sealed. In an alternative method, the spring disc and contact lens are inverted prior to dosing with the hydration medium such that the hydration medium contacts the lens prior to the spring disc. When the sealed single-use package is opened, the spring disc pops up as does the contact lens thereon. The equilibrated contact lens, however, will be above the level of the equilibrated spring disc.

**[00242]** Single-use packages 18, with and without spring discs 46, may take a variety of shapes. Figure 90 shows an oval shaped single-use package 171 with a notch 40 to aid the user in tearing the end of the cover 26 from the single-use package 171 to release the contact lens 4 therein. Figure 91 is the single-use

package 171 of Figure 90 with the cover 26 removed, thus allowing the spring disc 46e and contact lens 4 to be visualized. A rounded rectangle variation with a tear notch 40 is seen in Figure 91.

**[00243]** An oval single-use package 192 with a hinge-type cover 26 is shown in Figures 93 and 93A. The cover 26 in this embodiment is sealed around the periphery such that it may be peeled back but not completely removed. Instead it is peeled back far enough to expose the contact lens 4 and remains connected to the single-use package 192 at a hinged area 52. Thus, once the seal is broken, the cover 26 swings back like a door to allow access to the contents of the single-use package 192.

**[00244]** An asymmetrical teardrop shaped single-use package 173 is seen in Figures 94-95. In this embodiment, there are two tear notches 40 that allow the user to tear open the single-use package, at the narrow end, to expose the contact lens 4 therein. This shape allows two single-use packages 173 to be inter-fit and stored compactly, on a disc 54, making it an ideal option for traveling consumer.

**[00245]** A sachet type single-use package is seen in Figures 96-100. In Figure 96, a typical square shaped single-use package 169 with a tear notch 40 is seen. A rounded square with an enhanced tear-tab 53 is shown in Figure 97. In this embodiment, the tear-tab 53 is made more visible by two central areas 54 where foil has been cut away between the tear-tab 53 and the body 34 of the single-use package 193. A variation is seen in Figure 98 where there are notches 40 extending from the peripheral edge to the center to enhance the visibility of the tear-tab 53.

**[00246]** Figure 99 shows a rounded square shaped single-use package 175 with a finger-like tear tab 53 on one end. This tear tab 53 serves as a means of tearing open the single-use package 175 as well as a means of connecting two like single-use packages 18 as seen in Figure 100. The finger-like tear tabs 53 of two single-use packages inter-fit and therefore hold the two single-use packages 175 together.

**[00247]** In another embodiment, a double-curve shaped single-use package 176 is provided (see Figure 101). In this embodiment, a top sheet 14, such as



aluminum foil, may be welded to a bottom polypropylene sheet 15 without wrinkling. The top sheet 14 may be pulled back to expose the contact lens 4 therein. The double-curve shape allows a plurality of single-use packages 176 to be stacked compactly as shown in Figure 102.

**[00248]** Referring to Figure 103, a molded polyethylene base 50 and transparent polypropylene pull-top cover 58 are shown. In this embodiment, the pull-top cover 58 is pulled back beginning at one corner 59 where there is a portion of the pull-top cover 58 that is not adhered to the base 50, and is easily grasped. As the pull-top cover 58 is removed, the contact lens 4 therein is exposed.

**[00249]** A variation of the pull-top cover 58 of Figure 103 is shown in Figures 104-105. In this embodiment, there is a raised handle 56 to aid in removal of the pull-top cover 58. As shown, once the pull-top cover 58 is pulled back, the base 50 is bent to allow access to the contact lens 4. Although the handle 56 is provided for ease of opening, for users with weak fingers, such as the elderly, it is possible to use a key tip, or some other device, to help grip the handle 56 and thus more easily open the single-use package 178.

**[00250]** In another embodiment, a portion of the base folds 50 back with the cover 26. Referring to Figures 106-107, an elongated semi-circle shaped single-use package 179 is shown with a contact lens 4 and an aluminum cover sheet 26. The base 50 is an inner elongated semi-circle section that does not contact the peripheral section 51 except at the straight edge 55. To open this single-use package 179, both the outer peripheral section 51 and the aluminum cover 26 are peeled back to allow easy removal of the contact lens 4 therein.

**[00251]** In a variation of the single-use package 180 of Figure 106, there is a pointed edge 62 on the inner base section 50 that facilitates removal of the cover sheet 26. Although the single-use package 18 of this embodiment is shaped as a rounded rectangle, the inner section of the base 50 is in the shape of a pointed arch. Therefore, as the peripheral portion 51 is bent down slightly, the point 62 of the arch of the inner section pierces the cover sheet 26 and the sheet is pulled back

along a predetermined path, such as along a relief. Such reliefs 45 are provided for easy opening and may be fancy cut, perforations, or semi-cut.

**[00252]** In one embodiment of the single-use package 18 with a polypropylene spring disc 46g, the single-use package 181 has a tab 64 which snaps or breaks off of the main body 34 of the pack via a hinge 27 so that the single-use package 181 may be opened. As shown in Figures 110-113, once the connection between the tab 64 and the main body 34 is broken, by snapping it upward, the protective covering 26 may be peeled away to expose the contact lens 4 and polypropylene spring disc 46g. As the restraint of the protective cover 26 is removed, the polypropylene spring disc 46g reverts to its equilibrated, arched state as does the contact lens 4 thereon. The contact lens 4 may thus be pinched off between thumb and forefinger and inserted into an eye of the wearer. In this example, the spring disc 46g is polypropylene; however, the spring disc 46g may be made from a variety of other materials known to those skilled in the art, such as any suitable polyolefin or other such approved materials.

**[00253]** In an additional embodiment, the single-use package 182 is a retort-type package. Referring to Figure 114, there is shown a perspective view of a retort-type single-use package 182 according to one embodiment of the invention. The retort-type single-use package 182 comprises a layered, flexible envelope for holding a contact lens 4, which may be formed from one piece or two pieces of like or different flexible material. According to one embodiment, the retort-type single-use package 182 is manufactured from a single piece of a flexible, laminated material which is strong enough to protect a lens held in a space formed in the package, but flexible enough to withstand forces due to a variety of applied loads such as, but not limited to, bending, folding, twisting, rolling or crushing. The wall of the package, which is preferably a homogenous material, does not necessarily conform to the shape of a lens but rather the lens "floats" in the package. Such "floating" is achieved by the fluid forces within the close confines of the package which support and buffer the lens from the surface of the package. There is little or no air within the package, and as such, any internal movement is minimized.

**[00254]** The retort-type single-use package 182 may be formed by folding a homogenous material back on itself and sealing the edges to form a sterile envelope. Alternatively, the retort-type single-use package 182 may be formed from two opposing pieces of homogenous material, in opposing relationship, that are heat sealed along the edges. Access to the lens is gained by dividing the retort-type single-use package 182 along one or more predetermined heat sealed edges.

**[00255]** In Figure 114, the retort-type single-use package 182 comprises first and second barrier layers 14 and 15 which may be formed by folding one layer or by joining two separate barrier layers. The barrier layers 14 and 15 are heat sealed around edges 66, 68, 70, and 72. The heat sealing of edges 66-72 provides a boundary defining an internal space 74 in which a lens 4 is housed. The lens 4 is immersed in a predetermined, minimum amount of solution 48 which keeps the lens hydrated (see Figure 115). To release and expose the lens, barrier layer 15 may be peeled away from barrier layer 14. Alternatively, barrier layer 14 may be peeled away from barrier layer 15. To facilitate initial release of the barrier layers, a portion of the mating engagement between the layers is only lightly sealed, preferably at a corner to enable separation of the barrier layers. Figure 115 shows the retort-type single-use package 182 of Figure 114 torn open to release the lens 4.

**[00256]** According to one embodiment, the barrier layers 14 and 15 are multi-layer laminates comprising materials which enable compliance with statutory requirements for lens packages. For example, a typical retort-type single-use package 182 material may comprise a polyethylene terephthalate (PET) layer, an aluminum layer and a polyolefin layer such as polypropylene. A thin layer of aluminum has properties such as inherent pliability and inhibition of oxygen transmission which make it a good material as part of the barrier wall composite.

**[00257]** A retort-type single-use package 182 of a predetermined size may be formed from barrier layers of the same or different materials. According to one embodiment, the retort-type single-use package 182 may be formed by folding a single piece of material back on itself to form the space for holding the lens. In

another embodiment, two separate pieces of the same or different material, in opposing engagement, are heat sealed at their edges. According to one embodiment, the lamination profile of a barrier material may comprise an outer layer of 10  $\mu$  PET, a 50  $\mu$  aluminum layer, and a 50  $\mu$  polypropylene layer.

**[00258]** Turning now to Figure 116, a strip 41 of retort-type single-use packages 182, 78, and 80 are held together by frangible joins 76 and 77. The retort-type single-use package 182 may be separated one at a time by tearing off at the joins 76 and 77. Also, the strips may be folded about joins 76 and 77 which contribute to efficient storage and packaging. Thus 6 -8 and possibly more lenses could potentially be stored in the same space as two lenses using prior art blister packs 27.

**[00259]** In Figure 117, the strip of retort-type single-use packages 182, 78, and 80 of Figure 116 is shown, including a hydrating solution pack 35 attached to the package 182 via a frangible join 75. The solution pack 35 may be used by the consumer to hydrate the lens should supplementary lens hydration be required.

**[00260]** Figure 118 shows an exploded view of a carton 84 containing a large number of like envelopes 82 holding retort-type single-use package strips 41, according to one embodiment. Alternatively, the envelope may hold a plurality of individual retort-type single-use packages 182. It can be seen from this arrangement that a larger number of lenses may be stored per unit space compared to prior art packaging. Depending upon the tightness of the packaging, up to 10, and potentially more than 10 lenses may be stored in a space which would previously have been taken by two lens packages.

**[00261]** The form of retort-type single-use packages 182 described would preferably contain one soft contact lens each. The appropriate art work and statutory information may be printed on the external surfaces in a similar fashion to the current packaging.

**[00262]** The integrity of the lens in this retort-type single-use package 182 is preserved by a surrounding buffer of storage medium in the packet. The storage medium may act as a safety buffer if the lens package is subjected to rough or potentially damaging treatment. The current blister pack offers lens barrier

protection through the use of an injection molded, preformed rigid boat. However, the conventional blister package also includes an aluminum foil cover that bridges the opening to the blister pack. The unsupported foil offers no additional protection, and on the foil side, potentially less protection than a retort-type single-use package that has two flexible barrier layers that respond more favorably to applied loads. In fact, the aluminum surface of the blister packs can be more easily punctured due to its tightness over the polypropylene boat. The retort-type single-use package is inherently soft and can deflect potential punctures by moving with the puncturing object.

**[00263]** The retort-type single-use package 18 allows for a sufficient minimum amount of solution for maintenance of hydration and does not require that the lens swim in hydrating solution as in the prior art packages.

**[00264]** In the retort-type single-use package 182, according to the invention, excess hydration maintenance fluid may be forced out during the manufacturing process leaving a predetermined minimum amount of solution or gel to keep the lens hydrated. Due to the optimal sealing qualities of the retort-type single-use package 182, no vapor will escape from the internal space. The flatness of the package barrier layers will facilitate sticking of the lens to one or other of the internal surfaces providing the advantage that when a layer is peeled back to expose the lens inside, the lens will be stuck to an inner surface which ensures that the lens will not drop out during opening.

**[00265]** The manufacturing of disposable lenses becomes more cost effective as the cost of packaging the lens is reduced and the efficiency of sealing and subsequent sterilization is improved. Patients will be more likely to consider the lens a disposable item in the packaging of the present invention. Further, it takes up far less space and can be packaged in a more appealing fashion. This type of packaging especially suits daily disposable lenses as the cost component of this type of packaging is attractive to both consumers and manufacturers.

A variety of secondary packaging 86 configurations are possible with the single-use package as illustrated in Figures 119-164. One advantage of the single-use package is that a variety of secondary packaging options are available. In addition, the space

required to package a plurality of single-use packages is far less than that of the traditional blister packs. For instance, in Figures 119-123, a package of 30 single-use packages 187 is shown. There are five single-use packages 187 in each of the six compartments 90 sealed with a cover sheet 88, such as vacuum formed PET. The compartments 90 are connected by the cover sheet 88 as shown in Figure 120. Two of such packages 86 may be combined to provide a 30 day supply of contact lenses (that is, a total of 60 lenses). In this embodiment, the 30 day supply is only 270 x 60 x 12 mm. A 90 day supply of lenses is only 270 x 180 x 12 mm and a package with a 180 day supply is 270 x 240 x 20mm. The dimensions for the 30, 90 and 180 packs may vary as in the following non-limiting examples. A 30 day supply package may be 300 x 60 x 12 mm, or 255 x 60 x 13 mm, or 250 x 60 x 13 mm, or 245 x 60 x 13 mm, or even 240 x 55 x 13 mm. A 90 day supply pack may be 300 x 180 x 12 mm, or 255 x 180 x 13 mm, or 250 x 180 x 13 mm, or 245 x 180 x 13 mm, or even 240 x 165 x 13. A 180 day supply pack may be 300 x 240 x 20 mm, or 255 x 240 x 20 mm, 250 x 240 x 20 mm, or 245 x 240 x 20 mm, or even 240 x 220 x 20 mm.

**[00266]** In an alternative embodiment, there is a secondary package 86 for 30 single-use packages 187 with three compartments 90 holding 10 single-use packages 187 each. The compartments 90 are held together by a cover sheet 88. As shown in Figures 125a and 125b, the package is extremely compact, measuring 130 x 60 x 11 mm.

**[00267]** In one embodiment, a handbag kit or travel pack 91 is provided for a plurality of single-use packages 163, as seen in Figures 126-134. The single-use packages therein may be individual single-use packages or strips of single-use packages folded in zigzag fashion. The travel pack 91 is composed of transparent or opaque material and may optionally have a means for attaching a sunglass case. The travel pack may be opened by pressing a release button 93 and flipping the top 89 up. The travel pack may have a mirror 94 inside to provide a traveling user the ability to insert his contact lenses any place at any time. Further, the handle 92 of the travel pack 91 provides a means for hanging the travel pack, for example, on a hook such that the travel pack 91 is at eye level or stored in a safe place. The single-use packages 163 are held in the travel pack 91 by a sliding guide 96 to prevent the single-use packages 163 from falling out, as in Figure 129, or alternatively, the single-

use packages 163 are held in compartments 98 as shown in Figure 132, which may optionally display left and right indicia 100.

**[00268]** In another embodiment, the secondary packaging provides a 90 day supply of single-use packages 163 as in Figure 134. The 90 day package 104 holds the single-use packages 163 (either individual or strips folded in zigzag fashion) in a stacked arrangement and has a cover 102 attached that may optionally hold a travel pack 91 as described above and shown in Figure 133. As shown in Figure 135, the travel pack 91 may slide onto the cover 102 of the 90 day package 104. In addition, when the 90 day package is emptied, the package 104 may be used as a sunglass case (see Figure 136). The travel pack 91 may attach to the cover 102 and thus a combination travel pack 91 and sunglass case 104 is provided.

**[00269]** Figure 137 illustrates a 90 day package 104 with a removable insert 108. After removal of the cover 102, the insert 108 may be lifted out of the 90 day package 104 by the handle 109 provided. An anti-slip rubber stopper 110 prevents the insert 108 from sliding too far into the 90 day package 104 such that the handle 109 or single-use packages 163 therein would be difficult to reach. In one embodiment, tabs 112 are provided at regular intervals within the stack of single-use packages 163 to alert the user to diminishing supplies as in Figure 138. For instance, a tab 112 may indicate that there are only 30 contact lenses remaining in the 90 day package. Re-ordering information as well as prescription information may be included on the tab 112 to aid the user in purchasing additional contact lenses. Alternatively, the tab 112 may indicate that there are only 10 lenses remaining. Although 10 and 30 lenses are used as an example, the tabs 112 may be placed at any interval that would be useful to the contact lens wearer.

**[00270]** In another embodiment, the secondary packaging 114 for the single-use package 156 is a rectangular container or box with a low profile. As shown in Figure 139, the height of the container need not be very high, as the single-use packages 156 within are slim and compactly stacked. As assembled, the container 114 securely holds a plurality of single-use packages 156 while taking up minimal space. Alternatively, the secondary packaging 114 may be square, round, oval or any other shape conducive to holding a plurality of single-use packages 156.

**[00271]** In another embodiment, the single-use packages are affixed to a holder sheet 114 and subsequently placed in a secondary packaging container. A plurality of single-use packages 187 may be affixed to a single holder sheet 114, and all of the single-use packages 187 on a given holder sheet contain lenses of a single prescription. The single-use packages 187 may be affixed in a circular arrangement, as seen in Figures 140-141. Alternatively, the single-use packages 187 may be arranged in parallel rows as in Figures 142-143. Optionally, artwork of any variety may be displayed on the front 115 of the holder sheet in addition to manufacture, prescription, regulatory, and instructional information which may optionally be displayed on the back 116.

**[00272]** In another embodiment, the single-use package 183 is a blister-type package that may be stacked and housed in a circular configuration in circular secondary packaging, as shown in Figures 144-149. The blister-type single-use package 183 is made from a suitable injection molded plastic material. Each blister-type single-use package has a slim profile and maintains the contact lens therein in a flattened state that is less than the sagittal depth of the equilibrated contact lens. When stacked, the blister-type single-use packages stack compactly and take up minimal space. The stacks may then be housed in a circular configuration with an open center 120 for easy access to the single-use packages. In this arrangement, it is easy for the user to place a finger in the center 120 and remove one or more single-use packages 183 from the circular secondary packaging 118.

**[00273]** The circular secondary packaging 118 may house a 30 day supply, or a 90 day supply of contact lenses. Alternatively, the circular secondary packaging 118 may house between 30 and 90 day supply of contact lenses or even between 90 and 180 day supply. The circular secondary packaging has a base 118 as well as a lid 122 for securely housing the single-use packages 183 therein.

**[00274]** In another embodiment, the single-use package 184 is an asymmetrical rounded triangle with one or more tear notches 40, as shown in Figures 150-151. This particular flat 184 pack may be packaged on a disc 124 held by small tabs 126, in a set of six or more in a circular arrangement as shown.

**[00275]** An alternative embodiment is shown in Figures 152-154. The single-use package 185 is a rounded triangle that resembles the shape of a guitar pick. The



single-use packages 185 are held in place on a round holder sheet 124 by clipping means 128. Thus, individual single-use packages 185 may be easily removed from the sheet 124 by sliding the single-use package 185 off of the sheet 124. A plurality of single-use package holder sheets 124 may be placed in a box 123 that holds 10 or more single-use package holder sheets 124. More preferably, the box 123 will hold 20, 30 or more single-use package holder sheets 124. The box 123 containing a plurality of single-use package holder sheets 124 has a narrow open slot 130. This open slot 130 extends from the center of the box 123 to the periphery but does not extend all the way to the perimeter. The lid 122 of the box 123 has a hinged section 132 across the diameter of the box 123 and this hinged section lifts up from the perimeter toward the center. There is also provided a stand 136 upon which a plurality of the boxes 123 containing single-use package holder sheets 124 may be stored. As shown, the stand 136 is a base with a central extension that slides into open slot 130 of the single-use package holder sheets 124. When one or more boxes 123 containing single-use package holder sheets 124 is placed on the stand 136, the boxes 123 may be slid horizontally along the length of the slot 130. Therefore, as shown, a box 123 that is beneath another like box 123 may slide out without being removed from the stand 136. Access to the contents of the box 123 may be easily gained, and then the box 123 may be replaced in its original position. Contact lenses for both the right and left eye may be stored on the same stand 136. For instance, contact lenses for the left eye may be stored in the bottom boxes and contact lenses for the right eye may be stored in the top boxes. Alternatively, boxes may be stacked such that contact lenses for the right and left eyes alternate.

**[00276]** In another embodiment, round single-use packages 186 are held in a secondary package 114 that is shaped like an eye-mask. A plurality of single-use packages may be held in each compartment 141 and 143 of the package 114. The single-use packages 186 of this embodiment, shown in Figure 155, have a semi-circular indentation 140. This indentation 140 provides a place for the user to grasp the single-use package 186 and remove it from the secondary packaging 114. The eye-mask shaped package 114 may be transparent or opaque and may display left and right indicia.

**[00277]** Another embodiment provides a sheet 142 with two single-use packages 185 thereon. Figures 156-157 show how a single-use package 185 is fastened by clipping means 128 onto a single-use package carrying sheet 142. In this instance, the sheet 142 holds two rounded triangular shaped single-use packages 185. However, the number of single-use packages 185 as well as the shape of the single-use packages 185 may vary. Although the single-use packages in this example are attached to the single-use package holder sheet via clipping means, the single-use packages may also be attached with other forms such as adhesive or alternatively, insertion slots into which the corners of the single-use package may slide.

**[00278]** Advantageously, the sheets 142 with two single-use packages 185 clipped thereon may hold one left and one right daily use lens. Thus, a one day supply of lenses may be easily and compactly transported in a purse, wallet or pocket, as the sheet 142 is roughly the size of a business card. Optionally, a plurality of two single-use package carrying sheets 142 may be packaged in a container for delivery to the user. The container may contain 10, 20, 30, 90 or a 180 day supply of lenses.

**[00279]** Figures 158-159 illustrate variations of the secondary package 114 of Figure 118 that are possible with the single-use package 187. A variety of differently shaped single-use packages 187 may be compactly packaged in a variety of configurations with minimal space required.

**[00280]** Referring to Figures 160, a secondary packaging box 114 is provided for a plurality of circular single-use packages 188. The circular single-use packages have a section of the perimeter that is folded inwardly to form an opening 146 into which a clip 147 may fit and hold the single-use packages in place. A storage stand 144 is provided in Figure 161 which consists of a base and a wall that is at approximately, a right angle to the base. The plurality of circular single-use packages may be transferred from the secondary packaging of Figure 160 and clipped or snapped onto the stand 144 for storage of a 90 day supply of contact lenses. Single-use packages 188 may be removed from the stand 144 as needed. As shown, in this embodiment, there are two stacks of single-use

packages 188 on the stand. Therefore, one stack may hold single-use packages 188 containing a prescription contact lens for the left eye and one stack may hold contact lenses suited to the right eye. The stand may be reusable or disposable and may store greater or less than a 90 day supply of lenses.

**[00281]** A delivery package is shown in Figure 162. A plurality of single-use packages 190, in virtually any of the previously described packages and configurations, may be inserted into an envelope 148 for shipping. Preferably, the envelope 148 is a sealed aluminum-coated sac filled with nitrogen gas to act a cushion.

**[00282]** A single-use package dispensing case is illustrated in Figures 163-164. The dispensing case 150 opens from both ends to dispense single-use packages 189. For instance, one end dispenses single-use packages 189 containing contact lenses for the left eye and the opposite end dispenses single-use packages 189 containing contact lenses for the right eye. The dispensing case 150 is a cylinder and the single-use packages 189 therein are stacked on an angle such that when a cap 152 is opened, a single-use package 189 may be easily accessed by applying pressure to the removal area 154 and sliding a single-use package 189 from the dispenser 150. The caps 152 may display left and right indicia, prescription information, etc. The dispensing case 150 may be refillable or alternatively disposable.

**[00283]** The single-use package, in the embodiments described, offers a number of advantages over the prior art blister pack concept. First, the single-use package is smaller and slimmer which lends itself to disposability and is ideal for traveling. Additionally, batch sizes may be increased, yet storage space in an end user's package, may be reduced. The single-use package may be composed of foil sheets which stabilize light exposure and prevent oxygen transmission. Further, there is no air in the package, thus non-ballasted autoclaving is not required. The absence of air in the package likely contributes to lens stability in the package. Thus, the shelf-life of a contact lens in a single-use package may be extended. Overall, the single-use package is a more convenient and cost effective form of packaging.

**[00284]** It will be recognized by persons skilled in the art that numerous variations and modifications may be made to the invention as broadly described herein without departing from the overall spirit and scope of the invention.